EXAMPLE 2

Product features	Card based product	Product according to the invention
Content of thermal bonding fibres	50%	5%–45%
Content of cellulose fibres	50%	95%–55%
Length of thermal bonding fibres	12–60 mm	2–25 mm
Length of viscose fibres	6–60 mm	
Length of cellulose fibres	0–6 mm	0–6 mm
Length of alternative fibres (for example absorbent fibres)		2–25 mm
Dry strength, longitudinal direction	100 N/50 mm *)	25–50 N/50 mm *)
Dry strength, transverse direction	20 N/50 mm *)	15–30 N/50 mm *)
Wet strength, longitudinal direction	100 N/50 mm *)	19 N/50 mm *)
Wet strength, transverse direction	20 N/50 mm *)	11 N/50 mm *)
*) gram weight	65 g/sqm	65 g/sqm

As it can be seen, a great part of the expensive synthetic fibres in the conventional card based product has been replaced by cheaper cellulose fibres in the inventive product, which in this way can manufacture at a far lower price than the conventional product.

Simultaneously the inventive product's strength is favourable fairly identical in the longitudinal and transverse direction, while the conventional product's corresponding strength ratio is as 5–1.

It must be noted that the above described and on the drawing shown constructions forms only serve as considerate examples of, how a plant according to the invention can be arranged.

In this way the plant can, within the frame of the invention's protection scale after need be supplied with two, four, or a bigger number of forming heads, which besides do not necessarily need to be placed in a row just after one-another.

Furthermore in the production line one or several further sections can be inserted to in dependency of the wished quality to treat the fibre web.

What is claimed is:

1. A plant for producing a nonwoven fabric at least of synthetic fibres comprising:

at least one air-laying station comprising:

an endless wire,

a suction box, which is connected to a vacuum pump, said suction box being placed under said endless wire,

a house with one or more fibre inlets, said house being placed above the upper part of said endless wire,

a number of rotatably arranged wings for during operation distributing the fibres in a non-woven web upon the upper part of said endless wire, said wings being placed above said endless wire in said house,

at least one heat-treatment station for bonding the synthetic fibres by heating the web, said heat-treatment station being arranged downstream of said at least one air-laying station,

Another advantage consists of the oven **4**, now just needs to work as a drying oven, and therefore can work with a here fore fitted lower temperature, which size furthermore is uncritical.

FIG. **3** shows third construction form for a plant according to the invention and separates itself from the above described and shown in FIG. **1** first construction form by, instead of only one forming head three exists placed after one-another **41**, **42**, and **43**. Each of these forming heads are constructed in the same way as the first constructions form's forming head **1**. Similar parts are therefore indicated with the same reference numbers.

When the plant in this way is supplied with three forming heads, it can be used for production of sandwich-fibre web, which typically consist of a soft thermal bonded top- and bottom layer with an absorbent core. The sandwich-fibre web can for example have following combination.

EXAMPLE 1

Bottom layer **15** GSM

The proportions between the synthetic fibres and the absorbent fibres, such as cellulose fibres **10–5**. This means that 67% of the bottom layer consists of synthetic fibres and 33% of absorbent fibres.

Middle layer **30** GSM

The proportions between the synthetic fibres and the absorbent fibres, such as cellulose fibres **3–27**. This means that 10% of the middle layer consists of synthetic fibres and 90% of absorbent fibres.

Top layer **15** GSM

The proportions between the synthetic fibres and the absorbent fibres, such as cellulose fibres **7–8**. This means that 47% of the top layer consists of synthetic fibres and 53% of absorbent fibres.

The process processes in a way that the first forming head **41** will be supplied with the fibres for the bottom layer, the other forming head **42** with the fibres for the middle layer, and the third forming head **43** with the fibres for the top layer, thus the three layers will be formed in each layer's separate forming head **41**, **42**, **43** and successively will be laid on top of one-another. Subsequently the process continues in the same way as described for the first construction form.

The in FIG. **3** shown fourth construction form for a plant according to the invention separates itself from the above mentioned and in FIG. **3** shown third construction form by, now similar to the other construction form, and as shown in FIG. **2**, a special continuous thermal bonding oven **36** is inserted between the conveyor and the hydro-entangling section **3**. Similar parts are therefore also in this case indicated with the same reference numbers.

With this setting of the plant according to the fourth construction form the same advantages will be achieved as described in connection with the description of the other construction form.

In the below table indicated data respectively for a card based product and a product according to the invention serves the purpose of making the advantages clear, which can be achieved by the invention.

at least one hydro-entangling station for directing a number of powerful liquid jets against the bonded web, said hydro-entangling station being arranged downstream of said at least one heat-treatment station, and

means for continuous transport of the web through the plant.

2. A plant according to claim 1 wherein at least one drying station for drying the hydro-entangled nonwoven web is arranged downstream of the hydro-entangling station.

3. A plant according to claim 2 wherein the drying station is adapted to act upon the hydro-entangled nonwoven web with temperature sufficient to further bond the synthetic fibres.

4. A plant according to claim 2 wherein the drying station comprises a rotatable drum which has a perforated wall for during operation supporting a length of the hydroentangled nonwoven web and simultaneously allowing a stream of air to pass.

5. A plant according to claim 1 wherein the plant comprises at least three in succession arranged airlaying stations.

6. A nonwoven fabric comprising at least synthetic fibres produced in a plant comprising:

at least one air-laying station comprising:

an endless wire,

a suction box, which is connected to a vacuum pump, said suction box being placed under said endless wire,

a house with one or more fibre inlets, said house being placed above the upper part of said endless wire,

a number of rotatably arranged wings for during operation disbributing the fibres in a non-woven web upon the upper part of said endless wire, said wings being placed above said endless wire in said house,

at least one heat-treatment station for bonding the synthetic fibres by heating the web, said heat-treatment station being arranged downstream of said at least one air-laying station,

at least one hydro-entangling station for directing a number of powerful liquid jets against the bonded web, said hydro-entangling station being arranged downstream of said at least one heat-treatment station, and

means for continuous transport of the web through the plant.

7. A nonwoven fabric according to claim 6 wherein at least part of the synthetic fibres are bi-component fibres, which each consists of a core of a first plastic surrounded by a second plastic having a higher melting point than the first plastic.

8. A nonwoven fabric according to claim 6 wherein the fabric comprises cellulose fibres present in an amount of between 50% and 95%.

9. A nonwoven fabric according to claim 6 wherein the fabric comprises cellulose fibres present in an amount of between 60% and 90%.

10. A nonwoven fabric according to claim 6 wherein the fabric comprises cellulose fibres present in an amount of between 75% and 85%.

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NEW CLAIMS

11. A three-layered hydro-entangled sandwich fibre web comprising top, bottom and middle layers with the top and bottom layers comprising the nonwoven fabric of claim 6 and the middle layer comprising cellulose fibres.

12. A three-layered hydro-entangled sandwich fibre web comprising top, bottom and middle layers at least having synthetic fibres in the bottom and top layers and cellulose fibres in the middle layer.

13. A sandwich fibre web according to claim 12, wherein the cellulose fibres have a length of up to about 6 mm.

14. A sandwich fibre web according to claim 12, wherein the synthetic fibres have a length of about 2-25 mm.

15. A sandwich fibre web according to claim 12, wherein the middle layer further comprises synthetic fibres.

16. A sandwich fibre web according to claim 12, wherein the top and bottom layers further comprise cellulose fibres.

17. A sandwich fibre web according to claim 12, wherein the synthetic fibres are bicomponent fibres.

18. A sandwich fibre web according to claim 12, wherein the middle layer further comprises an alternative fibre.

19. A sandwich fibre web according to claim 18, wherein the alternative fibre comprises absorbent fibres having a length of about 2-25 mm.

20. A sandwich fibre web according to claim 12 in the form of wet wipes.

21. A sandwich fibre web according to claim 12 in the form of towels.

22. A sandwich fibre web according to claim 12 in the form of drapes.

23. A sandwich fibre web according to claim 12 in the form of gowns.

24. A process for forming a three-layered hydro-entangled sandwich fibre web, said process comprising:

supplying to a first forming head fibres for the bottom layer, said fibres comprising at least synthetic fibres;

supplying to a second forming head fibres for the middle layer, said fibres comprising at least cellulose fibres;

supplying to a third forming head fibres for the top layer, said fibres comprising at least synthetic fibres;

forming the three layers in the each layer's separate forming head;

successively laying the layers on top of one another whereby a three-layered sandwich fibre web is formed;

hyro-entangling the thus formed web for forming a strong bond between the fibres in the web; and

heating the web for bonding the synthetic fibres and drying the web.

25. The three-layered hydro-entangled sandwich fibre web produced by the process of claim 24.

26. A plant according to claim 1, wherein the plant is used for production of a three-layered sandwich-fibre web.

27. The three-layered hydro-entangled sandwich fibre web produced by the plant of claim 26.